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EXAMINER

MANOSKEY, JOSEPH D

ART UNIT	PAPER NUMBER
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2113

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DATE MAILED: 02/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/853,336

Applicant(s)

ARCHIBALD ET AL.

Examiner

Joseph Manoskey

Art Unit

2113

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-29 is/are rejected.
- 7) ☒ Claim(s) 7-9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 August 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because of the following:

On Fig. 1 the disk drives of the RAID system are labeled with references "112", "114", to "N", but in the specification on page 7, line 23 the disk drives are referenced as "112-1" to "112-N".

On Fig. 2 the sector stripes are labeled with references "210-1", "210-2", to "210-J", but in the specification on page 9, lines 6-7, they are referred to as "200-1" and "200-2". There is also inconsistent names being used between drawings and specification, in the drawings they are referred to as sector stripes but in the specification they are referred to as data stripes.

On page 10, in line 5, parity sectors are referred with number "204", but in Fig. 2 "204" is used in reference to the parity data while the sector itself is labeled with "208" in the same fashion as the data sectors are.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Steps "319", "320", and "323". A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

On page 9, line 14, the reference "08-N" should be replaced with "208-N".

On page 9, line 23 the reference numbers "208-1" to "208-N" are used in relation to data headers, but on the same page on line 14 they are used in relation to data sectors.

There are inconsistencies between Fig. 2 and the specification. In the figure several reference numbers have two appended numbers to them suggesting a two dimensional formatting scheme of the sectors, but in the specification on page 9 the reference numbers only have one appended number to them.

On page 14, line 5 and line 15, reference number "327" is used in relation to a uncorrectable error, but in Fig. 3 and 4 "327" is used in steps that occur when an error is correctable.

Appropriate correction is required.

Claim Objections

4. Claims 7-9 are objected to because of the following informalities:

Referring to claims 7 and 8, they recite the limitation "storing the new first code in the parity header" on their respective last lines. The specification says that the first code is stored in the header of data sectors. It is believed that the limitation should read "storing the new DCCss in the parity header", and will be interpreted as such to allow further examination.

Referring to claim 9, it recites the following: "calculating a new first code from each respective first code and the second code; and, comparing the new first code to the first code to determine if there is an inconsistency between the user data in the parity data." There appears to be some errors in this claim and it is believed that the claim should read as following: "calculating a new DCCss from each respective first code and the second code; and, comparing the new DCCss to the DCCss to determine if there is an inconsistency between the user data and the parity data." The claim is interpreted as such to allow further examination.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1-9, 12-15, 20, and 23-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Duffy, U.S. Patent 5,640,506.
6. Referring to claim 1, Duffy teaches a host computer coupled to a disk array controller which is in turn coupled to a plurality of data storage devices which provides data consistency checking and correction of user data stored in sectors with headers distributed across the drives and also includes a parity sector with a header (See Fig. 1 and 2). Duffy also teaches a first code representing the each data sector storing in the sector (See Fig. 2). The data check code is stored in the same sector as the data; this is interpreted as the data check code being stored in the header. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally

Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2).

7. Referring to claim 2, Duffy teaches the codes being data check codes. They are respectively interpreted as DCC_{ds} , DCC_{ps} , and DCC_{ss} (See Fig. 2).

8. Referring to claim 3, Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25). Though Duffy does not explicitly state the steps of regenerating the corrupt data and replacing the corrupt data, but he does state the system is a RAID system (See Col. 3, lines 5-10) which includes a parity drive (See Col. 3, lines 30-35), therefore it would be inherent that in the event the calculated check code did not match the store check code the system would regenerate the data and replace the corrupt data.

9. Referring to claim 4, Duffy teaches calculating new check codes and replacing the previous check codes with the new check codes (See Col. 5, lines 25-26).

10. Referring to claim 5, Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25). Though Duffy does not explicitly state the steps of regenerating the corrupt data and replacing the corrupt data, but he does state the system is a RAID system (See Col. 3, lines 5-10) which includes a parity drive (See Col. 3, lines 30-35), therefore it would be inherent that in the event the calculated check code did not match the store check code the system would regenerate the data and replace the corrupt data.

11. Referring to claim 6, Duffy teaches calculating new check codes and replacing the previous check codes with the new check codes (See Col. 5, lines 25-26).
12. Referring to claim 7 and 8, Duffy discloses calculating the new DCCss and replacing the old DCCss (See Col. 4, lines 37-49).
13. Referring to claim 9, Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25).
14. Referring to claim 12, Duffy discloses a program on a computer for performing a data consistency checking procedure for a system with a data distributed across data storage devices, parity data, and each sector having a header (See Fig. 1 and 2, and Col. 5, lines 27-65). Duffy also teaches a first code representing the each data sector storing in the sector (See Fig. 2). The data check code is stored in the same sector as the data; this is interpreted as the data check code being stored in the header. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2).
15. Referring to claim 13, Duffy discloses processing first code and second code (See Col. 4, lines 15-23 and Col. 5, lines 1-25).
16. Referring to claim 14, Duffy teaches an apparatus comprising a first communication link coupling the apparatus to a computer, a second communication link coupling the apparatus to a plurality of storage devices (See Fig. 1). Duffy also teaches the apparatus containing a processor for executing a program for data consistency

checking procedure (See Fig. 1 and Col. 5, lines 27-65). Duffy discloses storing a first code in the header of one or more data sectors distributed across the drives. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2).

17. Referring to claim 15, Duffy teaches a system for performing data consistency checking procedure (See Fig. 1 and Col. 5, lines 27-65). Duffy discloses storing a first code in the header of one or more data sectors distributed across the drives. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2).

18. Referring to claim 20, Duffy disclosing reading the data and comparing the old parity (See Col. 5, lines 17-19).

19. Referring to claim 23, Duffy teaches a method for performing data consistency checking procedure for data sectors with headers and a parity sector with a header (See Fig. 2). Duffy discloses storing a first code in the header of one or more data sectors distributed across the drives. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2).

20. Referring to claim 24, Duffy teaches discloses the third code being the XOR of all the check codes stored in the parity sector which allows for performing a consistency check without respective operations on each byte of data (See Fig. 2).

21. Referring to claim 25, Duffy teaches the codes being data check codes. They are respectively interpreted as DCC_{ds} , DCC_{ps} , and DCC_{ss} (See Fig. 2).

22. Referring to claim 26, Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25).

Though Duffy does not explicitly state the steps of regenerating the corrupt data and replacing the corrupt data, but he does state the system is a RAID system (See Col. 3, lines 5-10) which includes a parity drive (See Col. 3, lines 30-35), therefore it would be inherent that in the event the calculated check code did not match the store check code the system would regenerate the data and replace the corrupt data.

23. Referring to claim 27, Duffy teaches calculating new check codes and replacing the previous check codes with the new check codes (See Col. 5, lines 25-26).

24. Referring to claim 28, Duffy teaches a method for performing data consistency checking procedure for data sectors with headers and a parity sector with a header (See Fig. 2). Duffy discloses storing a first code in the header of one or more data sectors distributed across the drives. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2). Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25). Though Duffy does not explicitly state the steps of regenerating the corrupt data and replacing the corrupt data, but he does state the

system is a RAID system (See Col. 3, lines 5-10) which includes a parity drive (See Col. 3, lines 30-35), therefore it would be inherent that in the event the calculated check code did not match the store check code the system would regenerate the data and replace the corrupt data. Duffy teaches calculating new check codes and replacing the previous check codes with the new check codes (See Col. 5, lines 25-26).

25. Referring to claim 29, Duffy discloses a program on a computer for performing data consistency checking procedure for a system with a data distributed across data storage devices, parity data, and each sector having header (See Fig. 1 and 2, and Col. 5, lines 27-65). Duffy also teaches a first code representing the each data sector storing in the sector (See Fig. 2). The data check code is stored in the same sector as the data; this is interpreted as the data check code being stored in the header. Duffy discloses a second code for the parity data being stored in the parity header (See Fig. 2). Finally Duffy also discloses a third code being the XOR of all the check codes stored in the parity sector (See Fig. 2). Duffy discloses determining if the data is corrupt by reading the data, calculating a new check code and comparing the calculated check code with the stored check code (See Col. 4, lines 15-23 and Col. 5, lines 1-25).

Though Duffy does not explicitly state the steps of regenerating the corrupt data and replacing the corrupt data, but he does state the system is a RAID system (See Col. 3, lines 5-10) which includes a parity drive (See Col. 3, lines 30-35), therefore it would be inherent that in the event the calculated check code did not match the store check code the system would regenerate the data and replace the corrupt data. Duffy teaches

calculating new check codes and replacing the previous check codes with the new check codes (See Col. 5, lines 25-26).

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

27. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Duffy in view of Talagala et al., U.S. Patent Application Publication US 2003/0167439, hereinafter will be referred to as "Talagala".

28. Referring to claim 10, Duffy teaches all the limitations (See rejection of claim 7) except for reporting inconsistency of the new first code to the first code to the system administrator. Talagala discloses reporting a data loss condition (See Page 4, paragraph 39). It would be obvious to one of ordinary skill in the art at the time of the invention to use the reporting of data loss of Talagala with the comparison of the first codes of Duffy when they are not equal. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because data integrity is of the utmost importance in a RAID system (See Talagala, Page 4, paragraph 39).

29. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Duffy in view of Schmuck et al., U.S. Patent 5,987,477, hereinafter will be referred to as "Schmuck".

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30. Referring to claim 11, Duffy teaches all the limitations (see rejection of claim 1) except for locking to prevent a different entity from performing input/output operations on the data stripe. Schmuck discloses a RAID system (See Col. 17, lines 21-22) using locks and a lock management to prevent multiple separate peer computer nodes from simultaneously accessing files (See Col. 34, lines 1-9). It would be obvious to one of ordinary skill in the art at the time of the invention to combine the locks and lock management of Schmuck with the RAID system of Duffy. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because the lock management prevent conflicts among users (See Schmuck Col. 34, lines 1-3), these conflicts would cause data to become inconsistent.

31. Claim 16, 18, and 21^{and 22} are rejected under 35 U.S.C. 103(a) as being unpatentable over Duffy in view of Surugucchi et al., U.S. Patent 6,098,119, hereinafter referred to as "Surugucchi".

32. Referring to claim 16, Duffy teaches a data storage system that includes a host computer coupled to a plurality of data storage devices (See Fig. 1). Duffy also discloses a data checking technique performed on user data in one or more data sectors distributed across a plurality of disks, a parity sector for the user data, and both data sectors and the parity sector having respective headers (See Fig. 2). Duffy does not teach the system being able to offer different levels of data consistency, however Duffy does disclose the system including both parity information in a parity drive and data check code with each sector in the system. Surugucchi discloses a RAID controller that can configure a drive to a number of different RAID levels (See Col. 2,

lines 33-36). It would be obvious to one of ordinary skill in the art at the time of the invention to combine the multiple levels of RAID of Surugucchi with the RAID system of Duffy. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it allows the complex configuration of a RAID controller to be done without the user having knowledge required to do it (See Surugucchi, Col. 2, lines 6-10).

33. Referring to claim 18, Duffy and Surugucchi teach all the limitations (See rejection of claim 16) including the data consistency checking technique including a third code being the XOR of all the check codes stored in the parity sector which allows for performing a consistency check without respective operations on each byte of data (See Duffy, Fig. 2).

34. Referring to claim 21, Duffy discloses a program on a computer for performing a data consistency checking procedure for a system with a data distributed across data storage devices, parity data, and each sector having a header (See Fig. 1 and 2, and Col. 5, lines 27-65). Duffy does not teach the system being able to offer different levels of data consistency, however Duffy does disclose the system including both parity information in a parity drive and data check code with each sector in the system. Surugucchi discloses a RAID controller that can configure a drive to a number of different RAID levels (See Col. 2, lines 33-36). It would be obvious to one of ordinary skill in the art at the time of the invention to combine the multiple levels of RAID of Surugucchi with the program on the computer for performing a data consistency checking procedure of Duffy. This would have been obvious to one of ordinary skill in

the art at the time of the invention to do because it allows the complex configuration of a RAID controller to be done without the user having knowledge required to do it (See Surugucchi, Col. 2, lines 6-10).

35. Referring to claim 22, Duffy teaches an apparatus comprising a first communication link coupling the apparatus to a computer, a second communication link coupling the apparatus to a plurality of storage devices (See Fig. 1). Duffy also teaches the apparatus containing a processor for executing a program for data consistency checking procedure (See Fig. 1 and Col. 5, lines 27-65). Duffy does not teach the system being able to offer different levels of data consistency, however Duffy does disclose the system including both parity information in a parity drive and data check code with each sector in the system. Surugucchi discloses a RAID controller that can configure a drive to a number of different RAID levels (See Col. 2, lines 33-36). It would be obvious to one of ordinary skill in the art at the time of the invention to combine the multiple levels of RAID of Surugucchi with the apparatus of Duffy. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it allows the complex configuration of a RAID controller to be done without the user having knowledge required to do it (See Surugucchi, Col. 2, lines 6-10).

36. Claims 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Duffy and Surugucchi in view of Johnson et al., U.S. Patent 6,219,800, herein after referred to as Johnson.

37. Referring to claim 17, Duffy and Surugucchi teach all the limitations (See rejection of claim 16) except for only performing the data consistency checking if there

is data in the sector that has been modified since a last data consistency check.

Johnson discloses a RAID system that uses bit vector to indicate which stripes are "dirty" and is in need of a parity update (See Col. 3, lines 28-31). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the "dirty" bit vector of Johnson with the data consistency checking method of Duffy and Surugucchi. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it allows the parity updates to be delayed until the disk is idle (See Col. 3, lines 23-27).

38. Referring to claim 19, Duffy, Surugucchi, and Johnson teach all the limitations (See rejection of claim 17) including the data consistency checking technique including a third code being the XOR of all the check codes stored in the parity sector which allows for performing a consistency check without respective operations on each byte of data (See Duffy, Fig. 2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Manoskey whose telephone number is (703) 308-5466. The examiner can normally be reached on Mon.-Fri. (8am to 4:30pm).


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Beausoliel can be reached on (703) 305-9713. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

JDM

January 23, 2004


ROBERT BEAUSOLEIL
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